Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Evolution of Modes in Magnetically Insulated Crossed-Field Diodes KEITH CARTWRIGHT, TIM FLEMING, CHRIS FICHTL, CHRIS LENYK, Air Force Research Laboratory — The time-dependent behavior of electron sheaths in a magnetically insulated B>B_{Hull} anode-cathode gap with crossed electric and magnetic fields is studied. The crossed-field, diode is modeled for various magnetic fields by means of multidimensional (1d and 2d), self-consistent, electromagnetic, particle-in-cell (PIC) simulations. The transient behavior of the system is examined in detail and is divided into three separate stages: cycloidal flow, collapse of cycloidal flow and sheared (near-Brillouin) flow. It has been shown in 1d planar geometry that the cycloidal flows collapse into a steady, near-Brillouin flow.[1] Our 2d electromagnetic PIC simulations (both planar and cylindrical) show that cycloidal flows also collapses into a flow that is dominated by the E cross B drift, but is neither steady nor stable. The growth of the kinetic mode is faster than that of either magnetron or diocotron fluid instability. After the kinetic mode saturates, the fastest growing fluid mode grows to dominate the system. A slow wave structure (SWS) is added to the anode that matches the wavelength and frequency of the fastest growing fluid instability. The SWS is then perturbed so that wavelength and/or frequency does not match the smooth bore diode growth rate and the region of 'lock-in' to the SWS is found. This work is supported by a grant from AFOSR.

[1]P. J. Christenson, et.al., *Phys. Plasmas*, 3(12):4455–4462, Dec 1996.

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Date submitted: 21 Jul 2005 Electronic form version 1.4